Indoor Air Quality and the Function of Fresh Air Supplies and Exhaust Vents in Schools, Part I

Michael Feeney, R.Ph., J.D., C.H.O.
Chief, Emergency Response/Indoor Air Quality
Bureau of Environmental Health Assessment
MA Dept. of Public Health

This article is the first part of a series that explain how a building's indoor air quality can be affected by ventilation systems. This first installment explains the function of univents and exhaust vents.

Of the multitude of conditions that can effect indoor air quality in a school, the mechanical ventilation systems can play a significant role. Over the course of numerous building evaluations done by the Massachusetts Department of Public Health, Bureau of Environmental Health Assessment (BEHA), numerous public schools evaluated have had indoor air quality that was adversely effected by the mechanical ventilation systems. Some of these problems are related to operation, some are related to misunderstanding the purpose of mechanical ventilation equipment. Since the unit ventilator (univent) is the most commonly found equipment that is used to provide fresh air and temperature control in schools, the following will explain the function of this equipment in concert with a mechanical exhaust vent system in maintaining air quality.

The Univent

The univent is an air handling unit that provides fresh air for an individual room. Univents are preferred for use in rooms that require the introduction of large amounts of fresh air into a room while providing temperature control. The internal parts of the univent are illustrated in *Figure 1*.

The univent is usually positioned on the exterior wall of a classroom, usually underneath the window system. The univent draws fresh air from outdoors through a vent on the exterior wall. The univent also draws air from the classroom (return air). Air through each of these vents is controlled by louvers in the base of the univent. The percentage of fresh air is controlled by the angle that these louvers are set.

Fresh air and return air travel through a filter. The air is heated (or cooled) by the heating coil and ejected through the air diffuser by the univent fan.. Some univents are equipment to provide air-conditioning during summer months. Located underneath the cooling coil will be a drip pan to drain condensation. Univents are usually controlled through a thermostat located in the classroom. Centralized control through a pneumatic or computerized system can also be employed.

The Exhaust Ventilation System and the Creation of Airflow

Located on the interior wall in a exhaust vent that is connected by ductwork to a rooftop ventilation fan. Airflow into the exhaust vent system is usually controlled by adjustable louvers or
a flue that is opened by a draw chain-pulley system. Airflow in the flue system is controlled by setting the flue at a desired angle by setting the draw chain in a locking mechanism. The exhaust

system ductwork can be connected to either a open sheltered roof vent or an exhaust vent motor. Rooftop exhaust motor usually has a motor connected by a belt to a fan.

A functioning univent with an activated exhaust ventilation system will create airflow in the classroom. Airflow from and into vents is measured in cubic feet per minute (cfm). In general, the cfm output from the univent and the cfm drawn by the exhaust vent should roughly be equal (or in balance). *Figure 2* denotes air flow created by this ventilation system.

As the univent and exhaust vent function, airflow to distribute fresh air and heat/air condition air is created in each room. The exhaust ventilation serves to remove carbon dioxide, dust, water vapor and other pollutants from the classroom.

Part 2 of this series will describe how the ventilation system can malfunction through lack of maintenance.